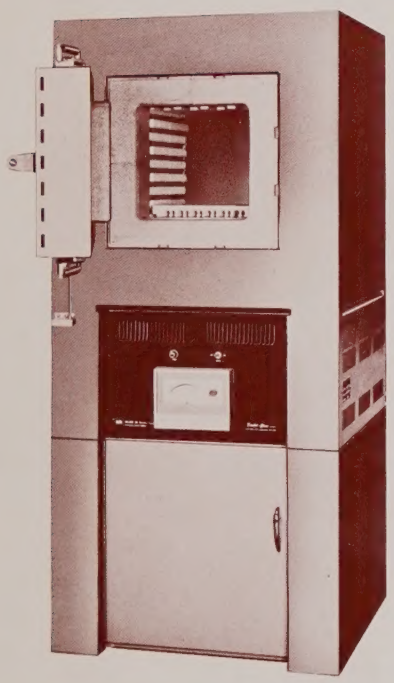
INSTRUCTION I-1002-2
FEBRUARY, 1968



OPERATION and MAINTENANCE MANUAL

BLUE M

Stabil-Glow

BOX TYPE FURNACES

MODELS 2010C-2, 2015F-2
8600F-2, 8615F-2
8625F-2, 8630F-2
8640F-2, 8650F-2
8655F-2, 8657G-2

BLUE M *Electric Company*

CORPORATE HEADQUARTERS: BLUE ISLAND, ILLINOIS 60406

OPERATION AND MAINTENANCE

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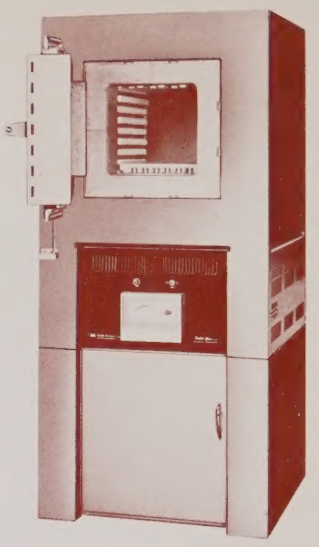


Blue M furnaces are manufactured to the highest standards of the industry and are designed to give reliable and satisfactory service, if PROPERLY INSTALLED AND MAINTAINED. Complying with the following instructions will assure long life and trouble-free operation.

TEMPERATURE RANGES (All Models)

CONTINUOUS OPERATION
+300°F. to +2000°F. (+149°C. to +1093°C.)

INTERMITTENT OPERATION
To +2200°F. (+1204°C.)

INSTALLATION

Carefully uncrate the furnace and all accessories. Visually inspect for any damage caused by improper handling during shipment. ALL CLAIMS FOR DAMAGE OR SHORTAGES MUST BE REPORTED IMMEDIATELY TO THE CARRIER. We will assist you if we are contacted. PLEASE DO NOT RETURN GOODS WITHOUT WRITTEN AUTHORITY.

LOCATION

This furnace will automatically control various temperatures within close tolerances for extended periods without adjustment. In order to produce results compatible with the furnace's capabilities, reasonable care in the choice of location will have to be exercised.

1. DO NOT locate in an area subjected to extremely wide ambient temperature variations, i.e., near outside entrances, windows, building heating and/or air conditioning vents.
2. Sufficient clearance (approximately 2 feet) should be allowed around entire furnace perimeter to facilitate air circulation and safety.

POWER CONNECTION

A main fused disconnect switch must be installed in power line to furnace. Information required for "sizing" fused disconnect and power wires may be found on data plate and/or wiring diagrams. Fuse protection should not exceed 125% of furnace's current rating.

DO NOT connect furnace to overloaded power lines. A 10% decrease in required input voltage will decrease furnace heating power by 19%. A 20% decrease in required input voltage will decrease furnace heating power by 36%. Refer to data plate for proper input voltage.

FURNACE MUST BE GROUNDED. Connect a suitable ground wire from the furnace to a good electrical ground.

CONTROL EQUIPMENT

"VERSATRONIK" TEMPERATURE CONTROL

This is a solid state, null balance, potentiometric controller with an independent meter movement for continuous indication of the furnace temperature. When indirect lighting in door assembly glows red, it indicates the furnace temperature has exceeded setpoint and heating elements are de-energized. Green illumination indicates temperature is below setpoint and heating elements are energized. Depressing knob on front cover switches meter and green pointer into control circuit to enable setpoint adjustment. Depressing and turning knob changes the setpoint. Releasing the knob returns meter and green pointer to indicating circuit.

The red pointer is merely an adjustable reference indicator of setpoint. IT DOES NOT INDICATE OR CONTROL TEMPERATURE.

Refer to the enclosed manufacturer's instructions for additional details on operation.

MAIN SWITCH

The main switch is a double pole, single throw toggle switch. Turning this switch "on" energizes furnace control circuit. When switch is "off", entire control circuit and main contactor are de-energized.

DOOR SWITCH

The door switch is a single pole, double throw microswitch. It is actuated by an extension on the door hinge. When door is opened, heating element contactor is de-energized. When door is closed, contactor is energized.

THERMOCOUPLE

All Blue M furnaces employ Magnesium Oxide filled, sheathed thermocouple with the "hot" junction grounded to the sheath. "Free oxygen" cannot attack the thermocouple and cause premature thermocouple burnout. Because of this isolation (from oxygen), a rapidly responding type thermocouple is employed. It is recommended thermocouples be replaced approximately every 12 months of furnace use. Spare thermocouples should be on hand to insure continuous service. Refer to replacement parts for proper part number.

VERSAGUARD OVERTEMPERATURE PROTECTION (OTP) (optional)

The Versaguard is a solid state overtemperature protection control utilizing a thermocouple sensor. It will shut the heating elements off when its setpoint temperature is exceeded. When indirect lighting in door assembly glows red, it indicates furnace temperature has exceeded the setpoint and heating elements are shut off. Green illumination indicates safe operation below the Versaguard's setpoint.

The OTP cut-off temperature should be set approximately 10°C. higher than required operating temperature. To set, proceed as follows:

1. Turn furnace main switch on.
2. With the Versaguard's meter door partly open, depress and hold the "Push To Set" button. At the same time, rotate setting knob until the green needle on meter indicates desired cut-off temperature (approximately 10°C. higher than control setting).
3. Release push button and close door.

Note: The red pointer is merely an adjustable reference indicator of the setpoint. IT DOES NOT INDICATE OR CONTROL TEMPERATURE.

Refer to the enclosed manufacturer's instructions for additional details on operation.

STANDARD OPERATION

1. Turn on main power source to furnace.
2. Turn on main switch.
3. Set required operating temperature on the Versatronik by depressing and turning knob on front of control.

OPERATION

FOR FURNACES EQUIPPED WITH VERSAGUARD OTP

1. Turn on main power source to furnace.
2. Turn on main switch.
3. Reset the Versaguard overtemperature protection by opening the door and pressing the "Push To Set" button until the meter glows green.

   REMEMBER: Manual resetting is required after any shutdown, overtemperature condition or line voltage power interruption.

   Set Versaguard approximately 10°C. above the required operating temperature.
4. Set required operating temperature on the Versatronik by depressing and turning knob on front of control.

   NOTE: BOTH THE VERSATRONIK AND VERSAGUARD FEATURE THERMOCOUPLE BREAK (TCB) PROTECTION BY PROVIDING ABOVE SETPOINT INDICATION AND SWITCHING IN THE EVENT OF AN OPEN CIRCUITED THERMOCOUPLE.

All Blue M furnaces are factory tested prior to shipment. But, because of damage that could conceivably occur to any electrical instrumentation due to improper handling in shipment, we recommend having the operator in attendance during the initial furnace run-up. A damaged instrument could allow the heating elements to burn out. When possible, the control indication should be verified with an accurate pyrometer or potentiometer during initial run-up. If indication proves to be faulty, the control must be recalibrated. Refer to the enclosed instructions for calibrating procedure.

MAINTENANCE

If furnace fails to heat, check the following:

1. Make certain main power source to chamber is turned on.
2. Check control fuse. This fuse is mounted on the control panel. If defective, a replacement fuse may be obtained at a local electronic supply store.
3. Check line fuses. They are located inside the control compartment and accessible by removing the rear control compartment cover (lower).

   IMPORTANT: Under no circumstances should a fuse(s) of a higher current rating be substituted in lieu of the line fuses. The most probable cause for one of the line fuses being defective is a short in the heating element circuit. In this situation, substitution of a higher rated fuse could cause the mercury contactor to rupture.

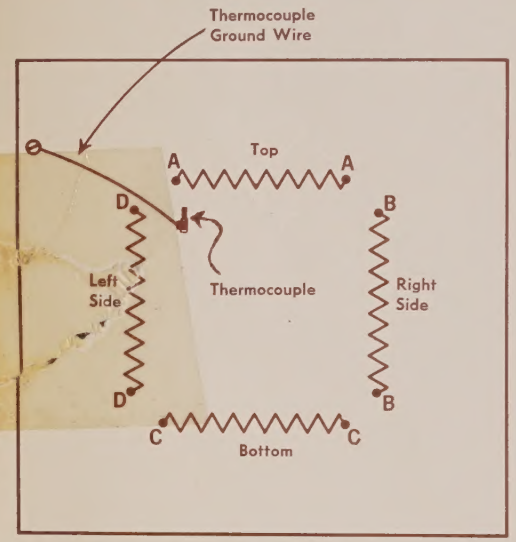
   Again, these fuses are a standard type and may be purchased locally.
4. Check for open circuited thermocouple. This condition will be indicated by the Versatronik and/or Versaguard green indicator needle being driven upscale and the heating elements de-energized.

   To replace thermocouple, proceed as follows:

   1. Remove both back panels.
   2. Remove the grounding clip holding the thermocouple in place.
   3. Disconnect thermocouple from controlling instrument.

   Reverse above procedure to install new thermocouple.

   IMPORTANT: When installing new thermocouple, be sure to attach the ground clip to thermocouple. This prevents stray A.C. interference from affecting control operation.
5. Check all electrical connections. Repair or tighten all connections.

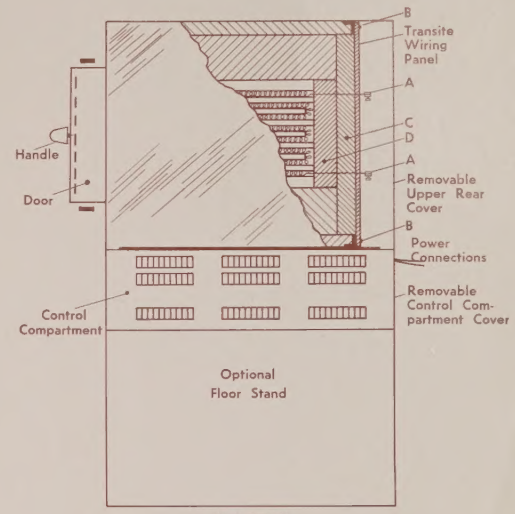


REAR VIEW

FIG. 1

6. Check heating elements for an open circuit. This is accomplished by removing the upper rear cover. The elements may be checked with an ohm-meter. CAUTION: TURN OFF MAIN POWER SOURCE TO CHAMBER. Referring to Figure 1, there are eight (8) studs protruding from the rear transite wiring panel. Studs (A) terminate the upper element, (B) the right side element, etc. Replace defective elements immediately.

NOTE: Extra high temperature wire (Kanthal) is used for Blue M furnace heating elements. After a short period of use at high temperature, the wire becomes hard and brittle. It is recommended when an element burn-out occurs, care be exercised in replacements. Having a complete set of four (4) heating elements on hand for future replacements will insure continuous use of the furnace.



SIDE VIEW

FIG. 2

Referring to Figure 2, element replacement is accomplished as follows:

1. Loosen screws "A" from all eight (8) "Burndy" connectors.
2. Remove thermocouple.
3. Remove all screws "B" from perimeter of transite wiring panel.
4. Remove transite wiring panel.
5. Remove thermoblock insulation (C).
6. Reach inside furnace and push insulating brick (D) outward.
7. Remove elements in the following order — top, sides, bottom.

To install new elements, reverse above procedure making certain to pull the element leads so that the coil completely fills the last refractory grooves. This insures uniform heating in the furnace.

ACCESSORIES

EXTRA Removable Load Trays: Constructed of high quality electrical refractory material. Available from factory stock. Refer to replacement parts list for proper part number.

Cabinet Type Floor Stand: Optionally available for all models. Quickly converts standard bench units into floor models. Specially designed for these furnaces to bring work chambers to convenient working height. Sturdy, all-welded steel construction finished in "fawn-beige" to match furnace. Provides handy shelf space for storage.

For Model 2010C-2	Cat. No. FS-156
For Model 2015F-2	Cat. No. FS-162
For Models 8600F-2 & 8625F-2	Cat. No. FS-157
For Models 8615F-2 & 8630F-2	Cat. No. FS-158
For Model 8640F-2	Cat. No. FS-159
For Model 8650F-2	Cat. No. FS-160
For Models 8655F-2 & 8657G-2	Cat. No. FS-161

GENERAL INFORMATION ON HEATING ELEMENTS

RESISTANCE TO CHEMICAL ATTACK

KANTHAL resistance wire is used exclusively for the heating elements in all Blue M Stabil-Glow Furnaces. The durability of resistance alloys in air, at high temperatures, is due to the formation of a protecting oxide layer formed by reaction with the oxygen in the air. The protective nature of this oxide layer is dependent on structure and nature of the crystals. Foreign materials usually interfere with the formation of the oxide layer, and this causes a reduction in life. KANTHAL alloys, in this respect, are no exception. At high temperatures, the protective layer on KANTHAL materials consists almost entirely of aluminum oxide. This has a gray-white color and good chemical resistance. At temperatures under +1000°C. (+1830°F.), the oxide layer has a darker color since it does not consist of pure aluminum oxide.

GASES

In gases with a low oxygen-yielding content, the oxide layer can become porous and admit damaging gases such as nitrogen. It is therefore recommended that KANTHAL elements which are to be used in reducing gases be preoxidized by first operating the element in open air. The elements are best preoxidized if the furnace is held at +1050°C. (+1920°F.), for 7 to 10 hours, after which the elements can be used in some protective atmospheres. If possible, it is advisable to preoxidize the elements periodically.

Pure hydrogen does not harm KANTHAL materials nor does cracked ammonia, but life in partially burned ammonia is somewhat shorter because of the higher nitrogen content. In the usual reducing gases, which are made from hydrocarbons, the life of KANTHAL elements is reduced.

Steam can sometimes reduce life as it disturbs the oxide layer.

In atmospheres with sulphur content, KANTHAL materials have a significantly longer life than nickel-containing resistance materials. In oxidizing gases with sulphur content, KANTHAL is particularly durable. Reducing gases with sulphur content reduce the normal life, but in such a case KANTHAL is still the only possible resistance material.

All halogens, such as chlorine or fluorine are harmful. Definite values for the life of KANTHAL elements working in such atmospheres cannot be given.

The following lists maximum temperatures at which KANTHAL alloys can be used. The values are primarily for preoxidized elements.

Furnace Atmosphere	Maximum Element Temperature (Kanthal "A" Wire) °C	°F
Air, Dry	1325	2417
Air, Moist	1200	2192
Hydrogen (H_2)	1300	2372
Nitrogen (N_2)	925	1697
Cracked Ammonia (NH_3)	1150	2102
Carbon Monoxide (CO)	1050	1922
Carbon Dioxide (CO_2)	1050	1922
Sulfur Dioxide (SO_2)	1050	1922
Hydrogen Sulfide (H_2S)	1000	1832
Reducing Gas A*	1075	1967
B*	1000	1832
C*	1025	1877

* Approximate Constituents of the Gases

	CO	CO_2	H_2	N_2
A	10	-	15	trace
B	5	10	5	trace
C	20	-	40	trace

IMPORTANT: . . . THE ABOVE INFORMATION, SUPPLIED BY THE KANTHAL CORPORATION, IS FOR REFERENCE USE ONLY. BLUE M ELECTRIC COMPANY DOES NOT SUPPLY FURNACES FOR USE WITH FLAMMABLE GASES.

MOLTEN METAL

Some molten metals, for example zinc, aluminum and copper, react with KANTHAL. Moreover, these metals oxidize easily and their oxides have an unfavorable effect.

FACTORY WARRANTY/GUARANTEE

COMPONENTS FOR BLUE M STABIL-GLOW BOX TYPE FURNACES

Description Of Component	Type of Warranty or Guarantee Time from Date of Shipment 60 Days	1 Year	Over 1 Year
Elements — Modella Heater	*A	A	A
Solid State Potentiometer	D	D	D
Indicator Pyrometer	B	C	A
Thermocouple	*A	A	A
Relay, Contactor	B	A	A
Load Trays, Electrical Refractory	*A	A	A
Miscellaneous Electrical Wiring Components — Pilot Lights, Resistors, etc.	B	C	A
Furnace Proper	C	C	A

* Although designed especially for furnace service and built of the finest materials available, these components cannot be guaranteed because it is impossible to predict the kind or severity of service to which they will be subjected.

A—Part not Guaranteed or Guarantee has expired.

B—New replacement part shipped immediately. Customer will be invoiced for part. Full credit issued upon receipt and inspection of defective part. All parts subject to our inspection for abuse, etc. Warranty void should our inspection indicate abuse, misuse, overheating, etc. Factory absorbs freight both ways with shipments made in regular manner. Air shipment charges will be made collect.

C—Defective part returned to our factory, transportation prepaid. If found defective, we will repair or replace at no charge. Repaired or replaced part(s) returned collect in accordance with customers instructions or method, which in our judgment, will be best. Warranty void should our inspection indicate abuse, misuse, over-heating, etc.

D—This item covered by separate manufacturer's warranty. Contact Blue M Electric Company for name and location of nearest service representative in your area.

NOTE 1. Guarantees do not apply to non-standard accessory items ordered with unit.

NOTE 2. Guarantees do not apply when our standard parts are substituted with parts from other suppliers with whom Blue M Electric does not have a working service agreement.

NOTE 3. Collect shipments are not accepted at factory without written or verbal permission from authorized personnel. If done so, we reserve the right to invoice for these collect charges.

NOTE 4. This warranty or guarantee is not transferable.

NOTE 5. To allow for installation of units all time limits are subject to a 30 day maximum extension period.

NOTE 6. Blue M Electric Company assumes no responsibility when alterations are made without consent.

NOTE 7. In no event shall Blue M Electric Company or any of its divisions be liable for consequential damages.

For spare parts and service, contact your local Laboratory Equipment Distributor, or any of the following Blue M Sales and Service Centers:

ARIZONA - SCOTTSDALE
44 East Indian School Road 85251
(602) 947-7026

CALIFORNIA - EL MONTE
9650 Telstar Avenue 91731
(213) 442-6672

CALIFORNIA - SAN MATEO
327 N. San Mateo Drive 94401
(415) 342-3983

CONNECTICUT - MILFORD
1340 Boston Post Road 06460
(203) 878-5937

GEORGIA - ATLANTA
2989 N. Fulton Drive, N.E. 30305
(404) 237-7644

ILLINOIS - BLUE ISLAND
138th and Chatham Street 60406
(312) 385-9000

MASSACHUSETTS - NATICK
15 Strathmore Road 01760
(617) 235-8320

NEW YORK - NEW ROCHELLE
271 North Avenue 10801
(914) 632-1465

PENNSYLVANIA - ARDMORE
219 East Lancaster Avenue 19003
(215) 649-1448

WASHINGTON - SEATTLE
1836 Westlake Avenue North 98109
(206) 282-0606

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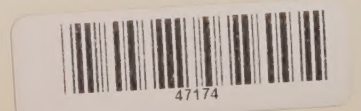
MANUFACTURERS AND ORIGINAL DESIGNERS OF CONSTANT TEMPERATURE CONTROLLED EQUIPMENT.



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